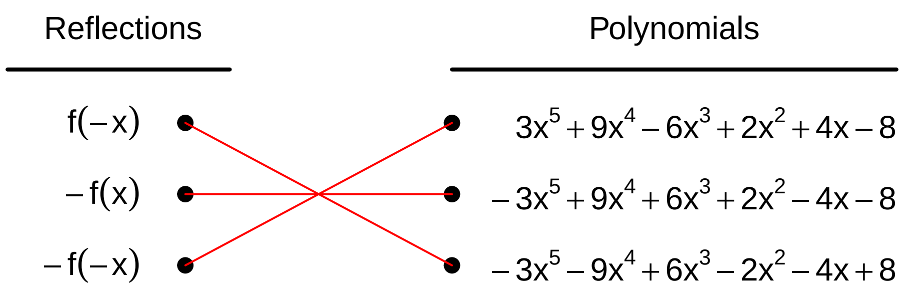
Name: Date:

Exam: Function Reflections (Solution version 605)

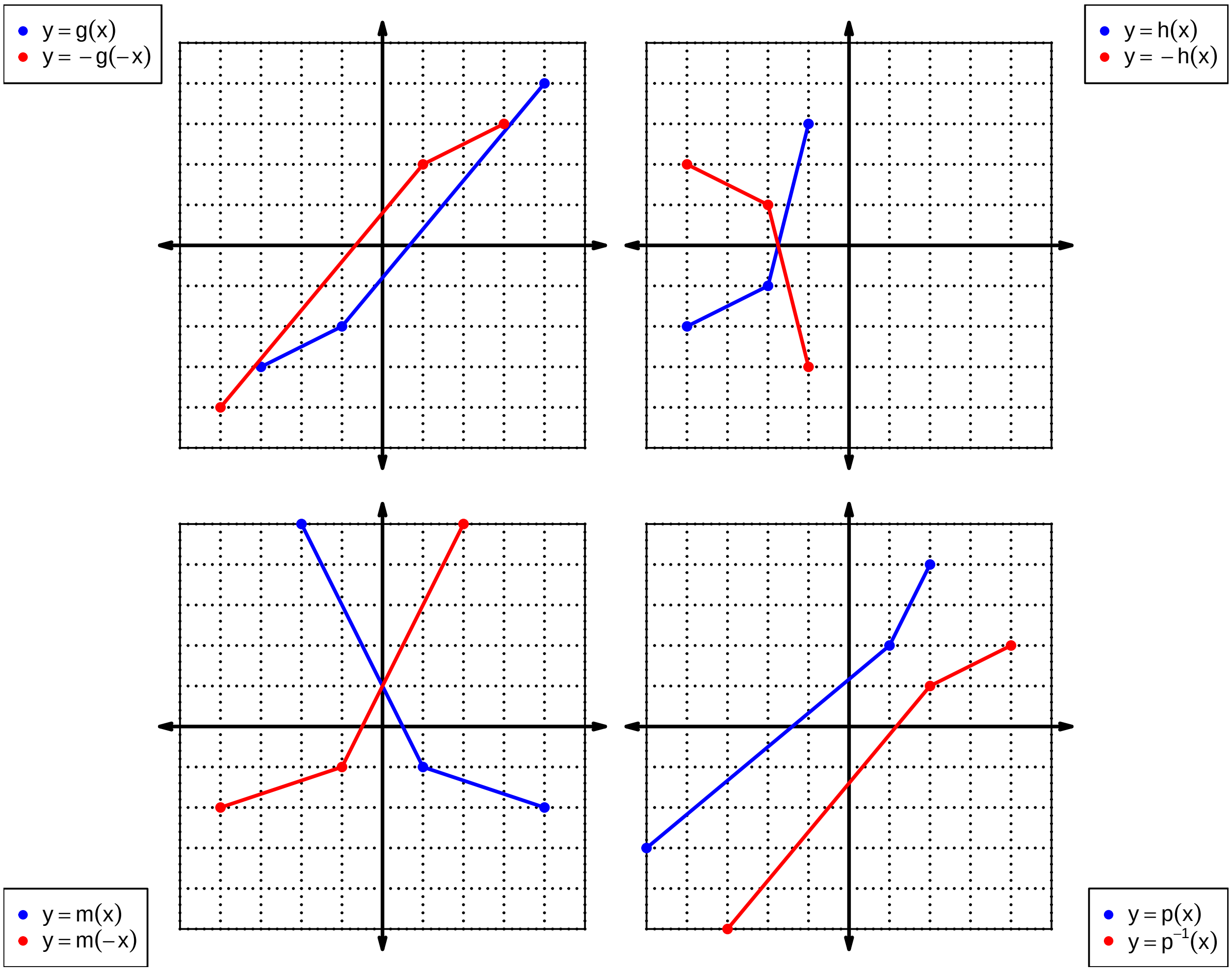
1. (worth 9 points) Let function f be defined by the polynomial below:

$$f(x) \;=\; 3x^5 - 9x^4 - 6x^3 - 2x^2 + 4x + 8$$

Draw lines that match each function reflection with its polynomial:



2. (worth 20 points) In each xy plane shown below, a function is graphed with blue. Draw the indicated reflections (as a second curve, indicated in legend) with black (or with whatever you have). The x axis is horizontal and the y axis is vertical (as typical), and the scale is equal on both axes.



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For all questions on this page, the functions f, g, and h are defined by the table below.

x	$f(x)$	$g(x)$	$h(x)$
1	4	7	3
2	2	8	9
3	9	9	4
4	8	1	7
5	1	3	2
6	7	6	1
7	5	2	8
8	3	5	6
9	6	4	5

3. (worth 3 points) Evaluate $f(9)$.

$$f(9) = 6$$

4. (worth 3 points) Evaluate $g^{-1}(2)$.

$$g^{-1}(2) = 7$$

5. (worth 3 points) Assuming f is an **odd** function, evaluate $f(-4)$.

If function f is odd, then

$$f(-4) = -8$$

6. (worth 3 points) Assuming h is an **even** function, evaluate $h(-1)$.

If function h is even, then

$$h(-1) = 3$$

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7. (worth 15 points) A function, f, is **even** if $f(x) = f(-x)$ for all x in the domain. A function, g, is **odd** if $g(x) = -g(-x)$ for all x in the domain.
   Let polynomial p be defined with the following equation:

$$p(x) \; = \; -x^3 - x$$

   a. Express $p(-x)$ as a polynomial in standard form.

$$\begin{aligned} p(-x) \; &= \; -(-x)^3 - (-x) \\ p(-x) \; &= \; x^3 + x \end{aligned}$$

   b. Express $-p(-x)$ as a polynomial in standard form.

$$\begin{aligned} -p(-x) \; &= \; -\left(x^3 + x\right) \\ -p(-x) \; &= \; -x^3 - x \end{aligned}$$

   c. Is polynomial p even, odd, or neither?

   odd

   d. Explain how you know the answer to part c.

   We see that $p(x) = -p(-x)$ for all x because $p(x)$ and $-p(-x)$ are equivalent polynomials. Thus function p satisfies the criterion for being an odd function.

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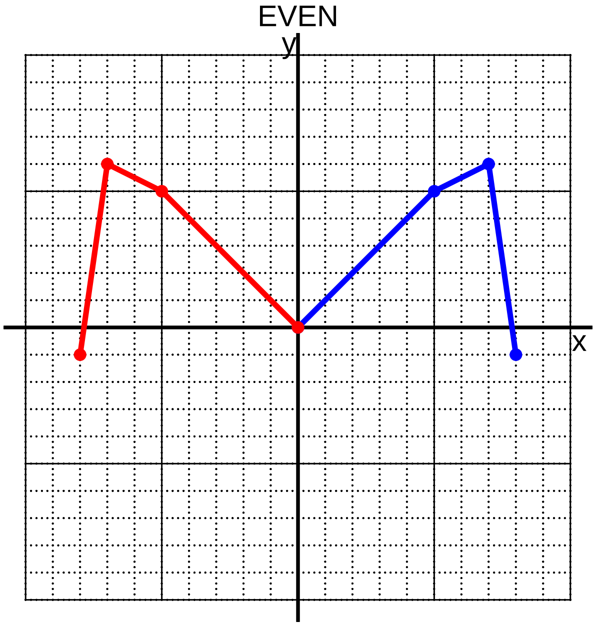
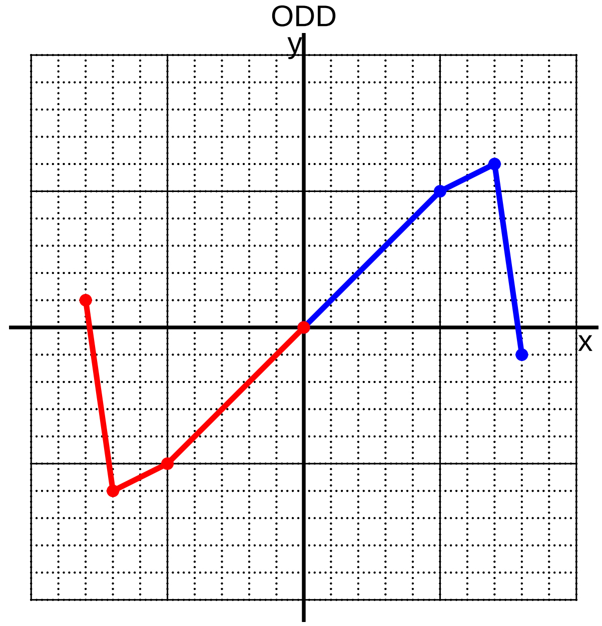
8. (worth 10 points) I have drawn half of a function. Draw the other half to make it even or odd.





9. (worth 10 points) Let function f be defined with the equation below.

$$f(x) = \frac{x+9}{8}$$

a. Evaluate $f(15)$.

step 1: add 9
step 2: divide by 8

$$f(15) = \frac{(15)+9}{8}$$
$$f(15) = 3$$

b. Evaluate $f^{-1}(2)$.

step 1: multiply by 8
step 2: subtract 9

$$f^{-1}(x) = 8x - 9$$
$$f^{-1}(2) = 8(2) - 9$$
$$f^{-1}(2) = 7$$

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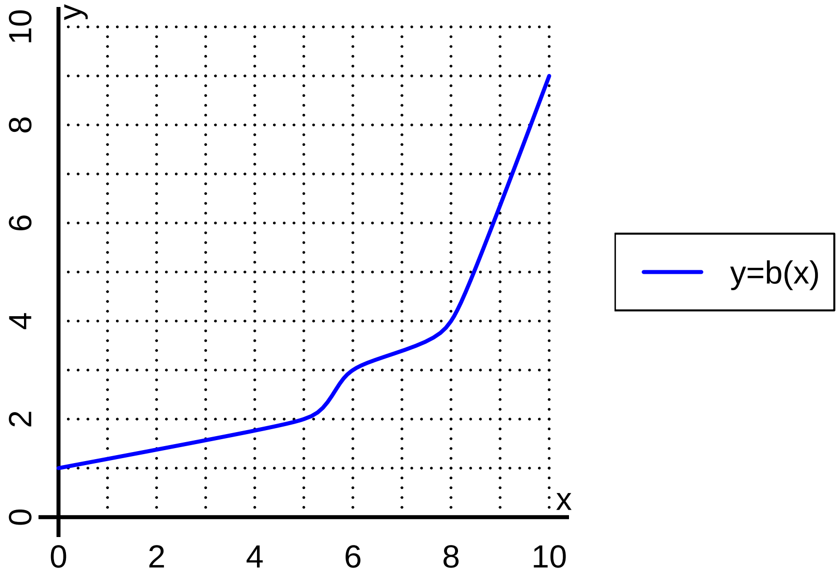
10. (worth 6 points) The function b is represented by the curve $y = b(x)$ graphed below.



a. Evaluate $b(6)$.

$$b(6) \;=\; 3$$

b. Evaluate $b^{-1}(2)$.

$$b^{-1}(2) \;=\; 5$$

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11. (worth 18 points) Function f is defined by the table below.

    a. Complete the columns for $-f(x)$ and $f(-x)$ and $-f(-x)$.

x	$f(x)$	$-f(x)$	$f(-x)$	$-f(-x)$
-2	3	-3	3	-3
-1	-9	9	-9	9
0	0	0	0	0
1	-9	9	-9	9
2	3	-3	3	-3

b. Is function f even, odd, or neither?

even

c. How do you know the answer to part b?

Function f is even because column $f(-x)$ matches column $f(x)$ exactly.